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|--|--|--|--|--|--|
| Form PTO-1390<br>(REV. 5-93)   |  | U.S. DEPARTMENT OF COMMERCE<br>PATENT AND TRADEMARK OFFICE |  | ATTORNEY'S DOCKET NUMBER<br>10537/195                |  |
| TRANSMITTAL LETTER TO THE UNITED STATES<br>DESIGNATED/ELECTED OFFICE (DO/EO/US)<br>CONCERNING A FILING UNDER 35 U.S.C. 371   |  |  |  | U.S. APPLICATION NO. (If known, see 37 CFR 1.5)      |  |
|  |  |  |  | 10/031683  |  |
| INTERNATIONAL APPLICATION NO.<br>PCT/DE00/02240  |  | INTERNATIONAL FILING DATE<br>(08.07.00)<br>08 July 2000    |  | PRIORITY DATES CLAIMED<br>(21.07.99)<br>21 July 1999 |  |
| TITLE OF INVENTION<br><b>EXTINGUISHER</b>  |  |  |  |  |  |
| APPLICANT(S) FOR DO/EO/US<br><b>BAUER, Karl; SANS, Joachim and SCHILLING, Steffen</b>  |  |  |  |  |  |
| Applicants herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information   |  |  |  |  |  |
| 1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.<br>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.<br>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) immediately rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).<br>4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.<br>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))<br>a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).<br>b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau.<br>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)<br>6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).<br>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))<br>a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).<br>b. <input type="checkbox"/> have been transmitted by the International Bureau.<br>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.<br>d. <input checked="" type="checkbox"/> have not been made and will not be made.<br>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).<br>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (Unexecuted)<br>10. <input checked="" type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).<br><b>Items 11. to 16. below concern other document(s) or information included:</b><br>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.<br>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.<br>13. <input checked="" type="checkbox"/> A <b>FIRST</b> preliminary amendment.<br><input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment.<br>14. <input checked="" type="checkbox"/> A substitute specification.<br>15. <input type="checkbox"/> A change of power of attorney and/or address letter.<br>16. <input checked="" type="checkbox"/> Other items or information: An English translation of the International Search Report; an English translation of the International Preliminary Examination Report, Marked-up version of the Substitute Specification and first page of the published International Application WO 01/07117. |  |  |  |  |  |

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17. ☒ The following fees are submitted:**Basic National Fee (37 CFR 1.492(a)(1)-(5)):**

Search Report has been prepared by the EPO or JPO ..... \$890.00

International preliminary examination fee paid to USPTO (37 CFR 1.482) ... \$710.00

No international preliminary examination fee paid to USPTO (37 CFR 1.482) but  
international search fee paid to USPTO (37 CFR 1.445(a)(2)) ..... \$740.00Neither international preliminary examination fee (37 CFR 1.482) nor international  
search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$1,040.00International preliminary examination fee paid to USPTO (37 CFR 1.482) and all  
claims satisfied provisions of PCT Article 33(2)-(4) ..... \$100.00**ENTER APPROPRIATE BASIC FEE AMOUNT =** \$ 890.00Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months  
from the earliest claimed priority date (37 CFR 1.492(e)).

\$

| Claims                                      | Number Filed | Number Extra | Rate       |    |  |
|---|--------------|--------------|------------|----|--|
| Total Claims                                | 4 - 20 =     | 0            | X \$18.00  | \$ |  |
| Independent Claims                          | 1 - 3 =      | 0            | X \$84.00  | \$ |  |
| Multiple dependent claim(s) (if applicable) |              |              | + \$280.00 |    |  |

**TOTAL OF ABOVE CALCULATIONS =** \$ 890.00Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must  
also be filed. (Note 37 CFR 1.9, 1.27, 1.28).

\$

**SUBTOTAL =** \$ 890.00Processing fee of \$130.00 for furnishing the English translation later the ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(f)).

+

\$

**TOTAL NATIONAL FEE =** \$ 890.00Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be  
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property

+

\$

**TOTAL FEES ENCLOSED =** \$ 890.00Amount to be:  
refunded \$

charged \$ 890.00

- a. ☐ A check in the amount of \$\_\_\_\_\_ to cover the above fees is enclosed.
- b. ☒ Please charge my Deposit Account No. 11-0600 in the amount of \$890.00 to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-0600. A duplicate copy of this sheet is enclosed.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Kenyon & Kenyon  
One Broadway  
New York, New York 10004  
CUSTOMER NO. 26646

SIGNATURE

Richard L. Mayer, Reg. No. 22,490  
NAME

DATE

10/031683

531 Rec'd PCT/F

22 JAN 2002

[10537/195]

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Inventor(s) : Karl BAUER et al.  
Serial No. : To Be Assigned  
Filed : Herewith  
For : EXTINGUISHER  
Examiner : To Be Assigned  
Art Unit : To Be Assigned

Assistant Commissioner for Patents  
Washington, D.C. 20231

**PRELIMINARY AMENDMENT AND  
37 C.F.R. § 1.125 SUBSTITUTE SPECIFICATION STATEMENT**

S I R:

Kindly amend the above-captioned application before examination, as  
set forth below.

**IN THE SPECIFICATION AND ABSTRACT:**

In accordance with 37 C.F.R. § 1.121(b)(3), a Substitute Specification  
(including the Abstract, but without claims) accompanies this response. It is  
respectfully requested that the Substitute Specification (including Abstract) be  
entered to replace the Specification of record.

**IN THE CLAIMS:**

On the first page of the claims, first line, change "What is claimed is:"  
to --WHAT IS CLAIMED IS:--.

Please cancel, without prejudice, claims 1 to 3 in the underlying PCT  
application.

Please also cancel, without prejudice, claims 1 to 3 in the annex to the  
International Preliminary Examination Report.

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Please add the following new claims:

- 4. (New) An extinguisher for fighting fire and incipient explosions, comprising:
- a device configured to generate compressed gas;
  - an extinguishing-agent vessel; and
  - at least one rupture diaphragm sealing the extinguishing-agent vessel and including a rupture joint, the rupture diaphragm curved in a direction of the device configured to generate compressed gas, the diaphragm including one of a central, planar surface and a depression curved away from the device configured to generate compressed gas.
5. (New) The extinguisher according to claim 4, wherein the rupture diaphragm includes a circumferential rupture joint at an edge of the rupture diaphragm.
6. (New) The extinguisher according to claim 4, wherein the central, planar surface includes a circular boundary.
7. (New) The extinguisher according to claim 5, wherein the central, planar surface includes a circular boundary.--.

#### **REMARKS**

This Preliminary Amendment cancels, without prejudice, claims 1 to 3 in the underlying PCT Application No. PCT/DE00/02240. This Preliminary Amendment further cancels, without prejudice, claims 1 to 3 in the annex to the International Preliminary Examination Report and adds new claims 4 to 7. The new claims, inter alia, conform the claims to U.S. Patent and Trademark Office rules and do not add any new matter to the application.

In accordance with 37 C.F.R. § 1.121(b)(3), the Substitute Specification (including the Abstract, but without the claims) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to U.S. Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. §§ 1.121(b)(3)(iii) and 1.125(b)(2), a Marked Up Version of the Substitute Specification comparing the Specification of

record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) is respectfully requested.

The underlying PCT Application No. PCT/DE00/02240 includes an International Search Report, dated January 29, 2001, a copy of which is included. The Search Report includes a list of documents that were considered by the Examiner in the underlying PCT application.

The underlying PCT Application No. PCT/DE00/02240 also includes an International Preliminary Examination Report, dated October 5, 2001. An English translation of the International Preliminary Examination Report and annex thereto is included herewith.

It is respectfully submitted that the subject matter of the present application is new, non-obvious and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully submitted,

KENYON & KENYON

Dated: 1/22/12

By: 

Richard L. Mayer  
Reg. No. 22,490

One Broadway  
New York, New York 10004  
(212) 425-7200

## EXTINGUISHER

The present invention relates to an extinguisher for fighting fire and incipient explosions, the extinguisher including at least one rupture diaphragm, which seals an extinguishing-agent vessel and has a rupture joint.

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To fight fire and suppress incipient explosions which are caused by flour dust, coal dust, or solvent vapors, one normally uses vessels that are filled with an extinguishing agent (usually extinguishing powder) and are permanently under pressure. In an emergency, these blow the extinguishing agent through a quick-opening valve, into the space where extinguishing is required.

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An extinguisher for fighting incipient explosions is described by DE 195 44 399 C2, where a tubular extinguishing-agent vessel is sealed on the inside and outside by flat rupture diaphragms. In the interior chamber adjacent to the inner rupture diaphragm, a compressed-gas generator is provided whose generated propellant gas ruptures the diaphragms and then expels the extinguishing agent. This extinguisher does not often achieve good results, since the rupture diaphragms seldom burst open in the center, or in an axially symmetric manner. Instead, the diaphragms rupture at a point outside their center, which causes the expelled extinguishing agent to be dispersed in a considerably asymmetric manner. However, it is necessary to expel all of the extinguishing agent in a uniform manner, in order to attain an optimum spray pattern and, thus, success in extinguishing.

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In addition, DE 42 24 184 A1 describes an extinguisher, where the extinguishing-agent vessel is sealed on the outside by a convex rupture diaphragm, which is provided with circular and radial rupture joints. This diaphragm already opens at a pressure of 0.1 to 1.0 bar above atmospheric pressure.

Connected to the extinguishing-agent vessel is a compressed-gas generator, which, in response to being triggered, mixes the extinguishing agent together with the compressed gas and sprays this mixture into the space where the extinguishing is to take place. In order for the extinguishing agent to have a rapid effect, it is more favorable for the extinguishing agent to only be dispersed after it is expelled from the vessel. The shape of the diaphragm used here also does not allow one to compensate for the change in the extinguishing-agent volume as a function of the temperature.

Other extinguishers are known, whose rupture diaphragms are spherically shaped so as to be inwardly concave in the direction of the compressed-gas generator, and are provided with a rupture joint. These rupture diaphragms bulge in response to pressure applied by the gas generator or thermally induced expansion, at some point that, as a rule, is not at the center of the diaphragms, but rather at an arbitrary position on the spherical diaphragm surface. The bulge extends to the other side in the form of an inversion and results in a rupture joint rupturing off-center. This again causes the extinguishing agent to be discharged in a nonuniform manner.

Therefore, the object of the present invention is to improve a rupture diaphragm for an extinguisher of the type mentioned above, so as to eliminate the above-mentioned disadvantages and cause the rupture diaphragm to burst open in the center, and thus uniformly disperse the extinguishing agent.

The object is achieved in a simple manner with the aid of the characterizing features of the main claim, and an advantageous embodiment follows from the features of the dependent claims. The particular advantage of the rupture diaphragm according to the present invention is that the planar surface or the depression in the center of the rupture diaphragm allows the

diaphragm to be easily inverted in the case of pressure being applied, without local bulging occurring. In this context, the rupture diaphragm behaves like a cup spring. In addition, the rupture diaphragm designed according to the present invention can compensate for thermal expansion of the extinguishing agent, since the planar surface or the depression in the center of the diaphragm is elastic in its movement in the axial direction.

A further advantage results from the circular shape of the planar surface in the center of the rupture diaphragm, in that a uniform load distribution is achieved in response to an applied pressure. This in turn supports a uniform inversion of the diaphragms and prevents them from bulging on the side. Finally, the inverting procedure causes the rupture joint provided on the edge of the rupture diaphragm to weaken prior to breaking, so that the actual rupturing event takes place simultaneously on the entire circumference, and the extinguishing agent is expelled in a uniform manner.

An exemplary embodiment is described in detail below and is represented in the drawing in a schematically simplified manner. The figures show:

Fig. 1 the construction type of an extinguisher having concave diaphragms, according to the related art;

Fig. 2 a section of an extinguisher cartridge, having a planar center of the diaphragm;

Fig. 3 a section of an extinguisher cartridge, having a central depression; and

Fig. 4 an inverted rupture diaphragm.

Represented in Fig. 1 is an extinguisher 1, which is constructed in a known manner and contains a pyrotechnic gas



generator 2. Rupture diaphragms 3 and 4, which are concave with respect to pyrotechnic gas generator 2, i.e. curved in the direction of the gas generator, seal extinguishing-agent cartridge 5 so that extinguishing agent 6 cannot escape.

5 Rupture diaphragms 3 and 4 are spherically shaped and have rupture joints in their diaphragm surfaces. In the case of pressure being applied, such rupture diaphragms bulge at some randomly determined point or at a weak point in the material. In the case of a distinct bulge, the nearest rupture joint  
10 begins to break.

In order to prevent such an occurrence, the present invention proposes forming the rupture diaphragms in a manner represented in Fig. 2. In this case, the center of rupture diaphragms 7 is in the form of a flat surface. Situated at  
5 the edge of rupture diaphragm 7 is rupture joint 8, which is impressed about the circumference. Temperature-dependent volume fluctuations are compensated for with the aid of the central, planar surface, by its elastic movement in the  
20 direction of main axis A of extinguisher 1. In the case of compressed-gas generator 2 being triggered, the two diaphragms 7 are simultaneously inverted, and the rupture joints 8 weakened by the inversion pull apart.

25 In Fig. 3, rupture diaphragms 9 are designed to be convex in their central region, i.e. curved away from the compressed-gas generator. This shape of the diaphragms has a positive effect in centrally focusing the pressure applied by gas generator 2.

30 Finally, Fig. 4 shows the procedure of inverting the two rupture diaphragms 7 shown in the resting state in Fig. 2, by the action of the applied gas pressure (arrows). During the inversion procedure, rupture joints 8 are first subjected to lateral flexure and then tensile stress. The rupture  
35 simultaneously occurs along the rupture line of the two rupture joints 8. The resting position of right rupture diaphragm 7 is represented in Fig. 4, by a dashed line.

What is claimed is:

1. An extinguisher for fighting fire and incipient explosions, comprising at least one rupture diaphragm that seals an extinguishing-agent vessel and has a rupture joint, wherein the rupture diaphragm (7, 9) is curved in the direction of a device (2) that generates the compressed gas, and has a central, planar surface (7) or a depression (9) that is curved away from the device generating the compressed gas.
2. The extinguisher as recited in Claim 1, wherein the rupture diaphragm (7, 9) includes a circumferential rupture joint (8) at its edge.
3. The extinguisher as recited in Claim 1 or 2, wherein the central, planar surface (7) has a circular boundary.

## Abstract

The present invention relates to an extinguisher having a compressed-gas generator for fighting fire and incipient explosions, the extinguisher processing at least one rupture diaphragm having a rupture joint, in order to seal the extinguishing-agent vessel. In its center, the rupture diaphragm has a planar surface or a depression, which causes the rupture joint to simultaneously open at its entire circumference; in order for the extinguishing agent to escape in an axially symmetric manner.

(Fig. 2)

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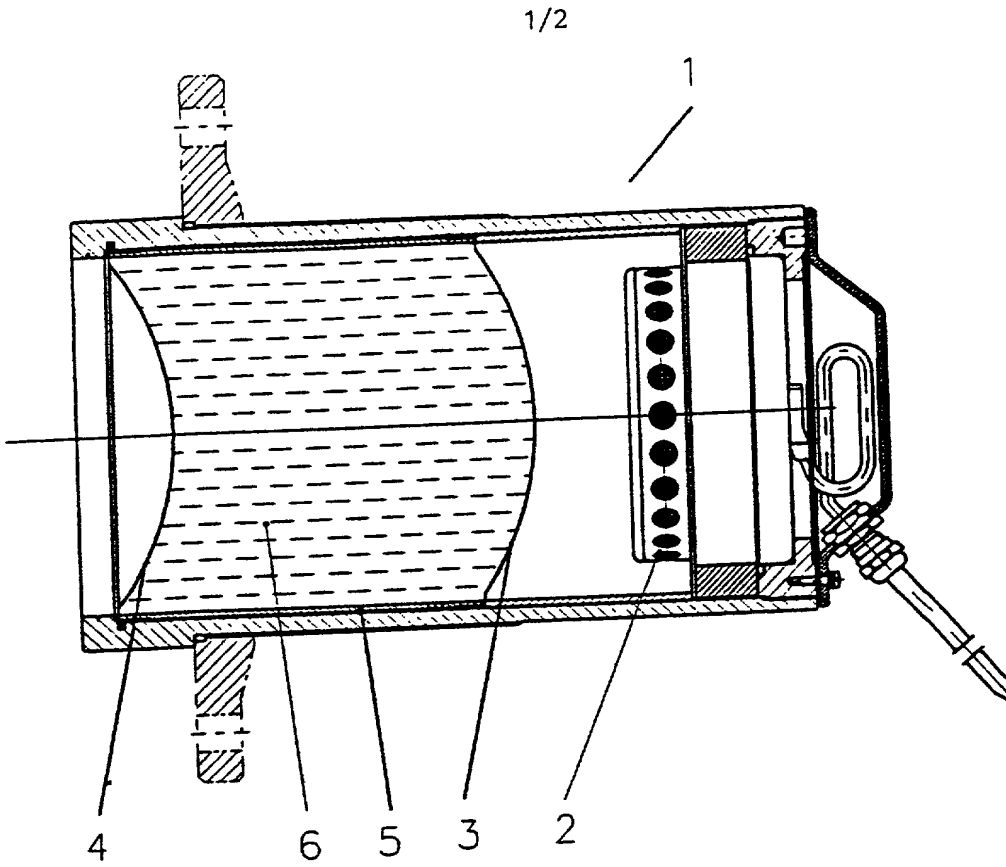


Fig. 1

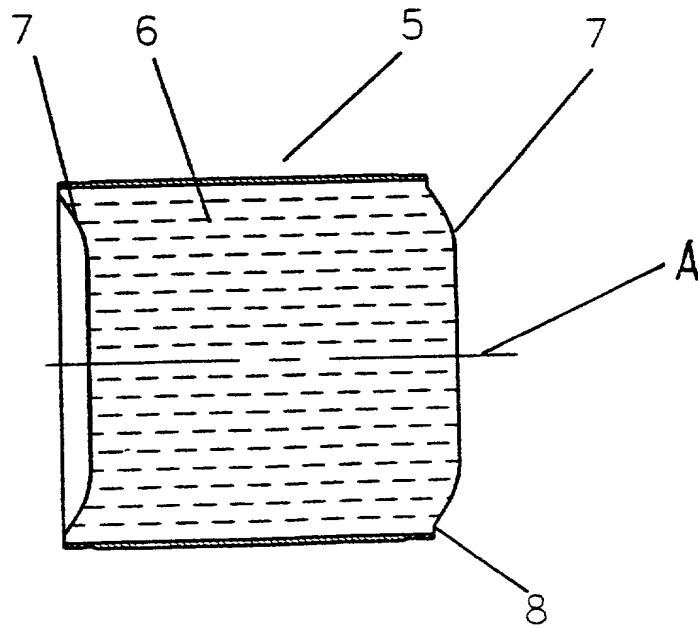


Fig. 2

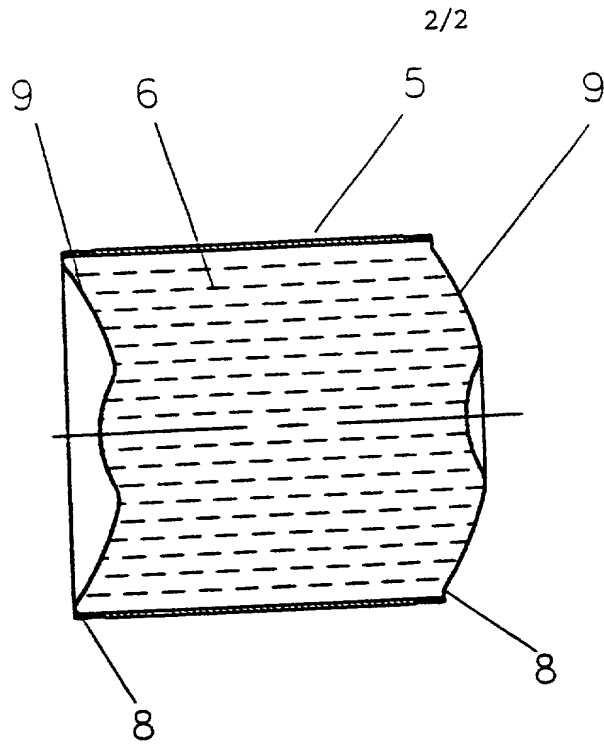


Fig. 3

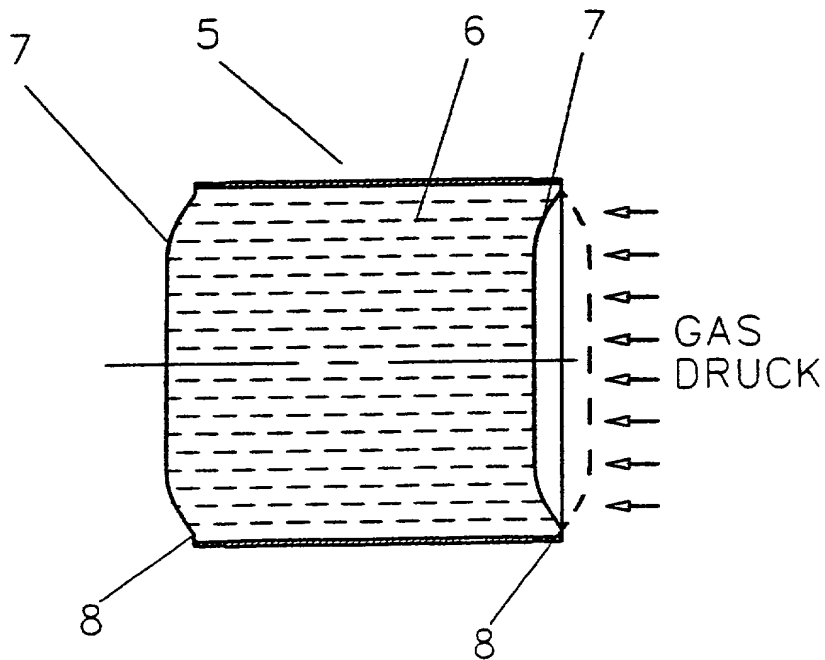


Fig. 4

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, we hereby declare that:

Our residence, post office address and citizenship are as stated below next to our names.

We believe we are original, first and joint inventors of the subject matter that is claimed and for which a patent is sought on the invention entitled **EXTINGUISHER**, the specification of which was filed as International Application No. PCT/DE00/02240 on 8 July 2000.

We hereby state that we have reviewed and understand the contents of the above identified specification, including the claims.

We acknowledge the duty to disclose information that is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

We hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

|              |                      |                           |   |
|--------------|----------------------|---------------------------|---|
| 199 34 164.8 | Fed. Rep. of Germany | 21 July 1999              | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |
| (Number)     | (Country)            | (Day/month/year<br>filed) | Priority Claimed<br>Under 35 USC 119                                |

And we hereby appoint Richard L. Mayer (Registration No. 22,490) our attorney with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Please address all communications regarding this application to:

KENYON & KENYON

**\*26646\***

Direct all telephone calls to Richard L. Mayer at (212) 425-7200.

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1-00  
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